Far-IR Detection Limits: Sky Confusion Due to Galactic Cirrus

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Fluctuations in the observed brightness of the background radiation can lead to confusion with real point sources. Such background emission confusion will be important for infrared observations with relatively large beam sizes since the degree of fluctuation tends to decrease with angular scale. In order to quantitatively assess the effect of this background emission on the detection of point sources for current and future far infrared observations by space-borne missions such as Spitzer, ASTRO-F, Herschel and SPICA, we have extended the Galactic emission map below the currently accessible scale to higher resolution. Using this high resolution map, we estimate the sky confusion noise due to the emission from interstellar dust clouds or cirrus, based on fluctuation analysis as well as carrying out photometry over realistically simulated images. We find that when the separation parameter is chosen to be the same value as the parameter related to the background estimation in the photometry, the confusion noise estimated by this fluctuation analysis generally agrees well with that based on realistic simulations. Though the confusion noise becomes dominant in longer wavelength bands for each space mission, the confusion due to cirrus structure is expected to be much less significant for the next generation of the space missions with larger aperture sizes (e.g. Herschel and SPICA) than that estimated from the observational data.

From Spitzer to Herschel and Beyond Pasadena, California, June 2004 Conference Program and Abstracts